



June 25, 2013

11381569

Alexis North  
Office of Enforcement, Compliance, and Environmental Justice  
EPA Region 8  
1595 Wynkoop Street (8ENF-AT)  
Denver, Colorado 80202-1129

**RECEIVED**  
**JUN 26 2013**  
**ECEJ-AT**

**RE: MARATHON OIL COMPANY – NSPS JJJJ INITIAL PERFORMANCE TESTING  
FINAL REPORT**

On behalf of Marathon Oil Company (MOC), Golder Associates Inc. (Golder) is submitting this final report to the Environmental Protection Agency (EPA) and Colorado Department of Public Health and Environment (CDPHE) for the NSPS JJJJ Initial Performance Testing completed as required in Permit Nos. 12WE1261, 12WE1546, and 12WE2205. Appendix A of this letter includes the test report for the engines installed at each of the locations. The testing was performed by Emissions Measurements Company (EMCo) of Denver, Colorado on June 10, 11, and 14, 2012.

If you have any questions regarding this letter or the attached report, please contact me at (970) 484-3857 or [Spark@golder.com](mailto:Spark@golder.com).

Respectfully,

**GOLDER ASSOCIATES INC.**

Scott R. Park  
Senior Consultant

cc: Jeremy Murtaugh (CDPHE)

Attachments or Enclosures: EMCo Emissions Testing Final Report

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**Appendix A**  
**EMCo Emissions Testing Final Report**



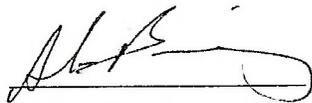
Emissions Testing Report for Marathon Oil Company  
NSPS JJJJ Initial Performance Testing  
Crow Valley 7-62-32-1H,  
Tsubaki Hills 08-62-34-4H,  
and Pawnee Creek 9-57-18-1H,  
Weld County, Colorado

Test Dates: June 10, 11 & 14, 2013

Project Code GA13-0045

## Certification Statement

I certify that all field data were acquired under my direction in accordance with a system designed to assure data quality. Based on reasonable inquiry, the information submitted is to the best of my knowledge true, accurate and complete.



Andrew Bruning  
Senior Project Manager  
Emissions Measurement Company

I certify that this document and all attachments were prepared under my direction in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on reasonable inquiry, the information submitted is to the best of my knowledge true, accurate and complete.



Matthew Parks  
Technical Director  
Emissions Measurement Company

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**Introduction**

EMCo was contracted by Golder Associates to conduct source testing services at three well sites in Weld County, Colorado. Testing was conducted to satisfy federal testing requirements. Contact information for the project is listed in the table below.

Contact	Affiliation	Telephone	E-mail
Scott Park Senior Project Scientist	Golder Associates	(970) 484-3857	scott_park@golder.com
Alexis North MACT Enforcement Team	EPA Region VIII	Office: (303) 312-7005	North.Alexis@epa.gov
Jeremy Murtaugh Testing Coordinator	CDPHE	Office: (303) 692-3130	Jeremy.Murtaugh@state.co.us
Andrew Bruning Senior Project Manager	EMCo	Mobile: (303) 810-2168	abruning@stacktest.us

**Scope of Work**

Testing was performed to determine concentrations and mass emission rates of nitrogen oxides (NO<sub>x</sub>) and carbon monoxide (CO) from three pump engines for comparison to the limits listed in NSPS Subpart JJJJ. The details of the testing program are given in the table below.

Well Site (Serial number)	Engine Type	Pollutant*	Emission Limit **	Test Runs / Duration
Crow Valley 7-62-32-1H (6B11B004112)	68 HP Arrow A-62 Pump Engine	HC + NO <sub>x</sub>	2.8 g/HP-hr	3 @ 1 hr
Tsubaki Hills 08-62-34-4H (6B11B003994)				
Pawnee Creek 9-57-18-1H (6B11B001112)		CO	4.8 g/HP-hr	
<p>*For natural gas-fired units &lt;100 HP, NSPS JJJJ allows the assumption that hydrocarbon (HC) emissions are equal to zero. Therefore, HC testing was not performed.  ** For natural gas-fired units &lt;100 HP, NSPS JJJJ allows calculation of alternate emission standards based on actual engine emissions, as follows: (HC+NO<sub>x</sub>)*CO<sup>0.791</sup></p> <p>Note: NSPS JJJJ VOC emissions limits do not include formaldehyde.  Abbreviations:  g/HP-hr: grams per brake horsepower-hour</p>				

**Proposed Testing Methods**

Compliance testing for NO<sub>x</sub> and CO was performed in accordance with EPA Reference Methods 3A, 7E, 10 and 19. EMCo personnel collected all available engine operating data during testing.

Parameter	EPA Reference Method
O <sub>2</sub> , CO <sub>2</sub>	3A
NO <sub>x</sub>	7E
CO	10
Emission Rates (g/HP-hr)	19

### Testing Locations

The sampling location on each engine consisted of a vertical, round stack with interior diameter of four inches. Pollutant measurements were performed at a single point in each stack.

### Testing Results

The results of the testing program are summarized in the table below. Each emission result represents the average of three 60-minute test runs. Detailed testing results can be found in Appendix A, along with sample calculations for all computed values.

Marathon Oil Company Test Results Summary	Tsubaki Hills 08-62-34-4H	Permit Limit	Pawnee Creek 9-57-18-1H	Permit Limit	Crow Valley 7-62-32-1H	Permit Limit
Date	6/10/2013	—	6/11/2013	—	6/14/2013	—
Engine RPM	1,800	—	1,800	—	1,800	—
Catalyst Inlet Temperature (°F)	571	—	573	—	559	—
Catalyst Outlet Temperature (°F)	597	—	608	—	614	—
NO <sub>x</sub> (g/HP-hr)	0.8	2.8	2.2	2.8	2.3	2.8
CO (g/HP-hr)	3.3	4.8	0.9	4.8	4.3	4.8
NO <sub>x</sub> (tons/year)	0.5	1.9	1.5	1.85	1.5	1.9
CO (tons/year)	2.2	3.7	0.6	3.71	2.8	3.7

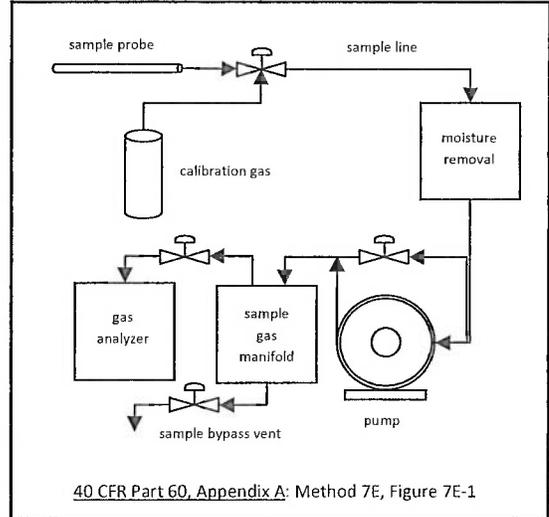
### Testing Equipment

All testing equipment was housed in a climate-controlled mobile analytical laboratory custom-designed and built by EMCo. All required quality assurance tests (i.e., NO<sub>x</sub> converter efficiency test, etc.) were performed as required by the applicable Reference Methods. Detailed equipment descriptions are given in the table below.

Parameter	Equipment	EPA Reference Methods
Oxygen (O <sub>2</sub> )	Horiba PG-250 Zirconia Sensor	3A
Carbon Dioxide (CO <sub>2</sub> )	Horiba PG-250 Non-Dispersive Infrared (NDIR) Analyzer	3A
Nitrogen Oxides (NO <sub>x</sub> )	Horiba PG-250 Chemiluminescent Analyzer	7E
Carbon Monoxide (CO)	Horiba PG-250 Non-Dispersive Infrared (NDIR) Analyzer	10

### Test Details

Pollutant gas testing was performed using EPA Methods 3A, 7E and 10. Each compliance test comprised three one-hour test runs. The O<sub>2</sub>, CO<sub>2</sub>, NO<sub>x</sub> and CO sample was withdrawn from the exhaust stack at a constant flow rate, transported through a heated Teflon sample line, through a moisture removal system, and directed to a Horiba PG-250Z O<sub>2</sub> / CO<sub>2</sub> / NO<sub>x</sub> / CO Analyzer. (See the diagram of EPA Method 7E at right.) Concentrations of O<sub>2</sub> and CO<sub>2</sub> were reported in units of dry volume percent (%vd); concentrations of NO<sub>x</sub> and CO were reported in units of parts per million on a dry volume basis (ppmvd). Analyzer data were logged in 10-second increments and recorded as 60-second averages to an Excel spreadsheet. Following each test run, the analyzers were challenged with EPA Protocol 1 calibration gases to determine instrument drift and to correct the analyzer data for system bias. NO<sub>x</sub> and CO concentration data were combined with concurrent diluent concentrations to calculate pollutant emission rates in units of pounds per million British thermal units (lb/mmBtu). Pollutant emission rates were combined with rated heat input and rated horsepower to calculate pollutant mass emission rates in units of pounds per hour (lb/hr) and grams per horsepower hour (g/HP-hr). Pollutant mass emission rates were combined with allowable operating hours to calculate emissions in units of tons per year (tpy).



**Quality Control / Quality Assurance Objectives**

The table below lists all mandatory QA/QC specifications for each EPA Reference Method used during this testing program. As shown, all QA/QC specifications were met.

Reference Method	Section	QA/QC Specification	Acceptance Criteria	Actual Value		
				O <sub>2</sub>	NO <sub>x</sub>	CO
3A, 7E, 10	8.2.1	Traceability protocol (G1, G2)	Valid certificate required. Uncertainty ≤2.0% of tag value	All gases EPA Protocol G1.		
	3.3.3	High-level gas	Equal to the calibration span	21.1%	332ppm	1510ppm
	3.3.2	Mid-level gas	40 to 60% of calibration span	10.5%	145ppm	776ppm
	3.3.1	Low-level gas	≤20% of calibration span	0%	0ppm	0ppm
	6.2.3	Probe, filter and sample line temperature.	For dry-basis analyzers, keep sample above the dew point by heating, prior to sample conditioning.	Probe and Sample Line Heated to 265°F		
	8.2.3	Analyzer calibration error	Within ±2.0% of the calibration span of the analyzer for the low-, mid-, and high-level calibration gases. Alternative specification: 0.5 ppmv absolute difference.	Max = 1.0%	Max = 0.6%	Max = 0.9%
	8.2.5	System bias	Within ±5.0% of the calibration span of the analyzer for low-scale and upscale calibration gases. Alternative specification: 0.5 ppmv absolute difference.	Max = 0.9%	Max = 2.6%	Max = 1.6%
	8.2.5	System response time.	Determines minimum sampling time per point.	N/A: Single Point Sampling		
	8.5	Drift	3.0% of calibration span for low-level and mid- or high-level gases. Alternative specification: 0.5 ppmv absolute difference.	Max = 0.5%	Max = 2.8%	Max = 2.2%
	8.2.4 (16.2)	NO <sub>2</sub> -NO conversion efficiency.	≥90% of certified test gas concentration	Difference = 0.0% (Using Alternate Procedure from 16.2.2)		
	8.4	Purge time	≥2 times system response time	>30 min.		
	8.4	Minimum sample time at each point.	Two times the system response time	60 Minutes at Single Point		
	8.4	Stable sample flow rate (surrogate for maintaining system response time).	Within 10% of flow rate established during system response time check.	3.5 Lpm Throughout Calibration and Test		
	8.1.2	Stratification test*	All points within: ±5% of mean for 1-point sampling.	N/A: See Note Below*		
	8.4	Frequency	1 minute average	60-second averaging		
8.4	Average concentration for the run.	Run average ≤ calibration span	O <sub>2</sub> Max = 22%	NO <sub>x</sub> Max = 66%	CO Max = 97%	

\* EPA's website states "The stratification test requirements in Method 7E do not lend themselves well to the small-diameter stacks of stationary combustion engines. The emissions from these sources should be well mixed after a muffler... We have also found that emissions from engines in general are too temporally variable to render a stratification test meaningful." Accordingly, stratification testing was not performed during this testing program.

### **Supporting Information**

Additional data for this testing program are appended as follows:

#### **Appendix A: Test Data**

- Data Reduction Spreadsheets
- Sample Calculations

#### **Appendix B: Field Data**

- Engine Operating Data
- Field Datasheets

#### **Appendix C: Quality Assurance Data**

- Analyzer Calibration Tests
- NO<sub>2</sub>→NO Converter Efficiency Test
- Analyzer Interference Check (EPA Verification)

#### **Appendix D: Calibration Information**

- EPA Protocol 1 Gas Certificates



**Project GA13-0045**  
**Appendix A: Test Data**  
Data Reduction Spreadsheets  
Sample Calculations

Tsubaki Hills  
08-62-34-4H

GA13-45  
 Marathon Oil Company  
 Tsubaki Hills 08-62-34-4H  
 6/10/2013

	Run 1	Run 2	Run 3
Start Time	10:10	11:20	12:30
Stop Time	11:10	12:20	13:30

EPA Method 3A, 7E and 10 Data	1	2	3	Average	Limit
O <sub>2</sub> (%vd)	4.7	4.5	4.2	4.5	
CO <sub>2</sub> (%vd)	10.0	10.2	10.3	10.2	
NO <sub>x</sub> (ppmvd)	119.7	141.0	165.5	142.1	
CO (ppmvd)	848.6	898.8	1031.5	926.3	

Mass Emission Calculations (Using EPA Method 19)	1	2	3	Average	Limit
F <sub>d</sub> Method 19 F-Factor (dscf/mmBtu)	8,710	8,710	8,710	8,710	
NO <sub>x</sub> (lb/mmBtu)	0.160	0.187	0.216	0.188	
CO (lb/mmBtu)	0.691	0.724	0.819	0.745	
Fuel Consumption (mmBtu/hr)*	0.66	0.66	0.66	0.66	
NO <sub>x</sub> (lb/hr)	0.11	0.12	0.14	0.12	
CO (lb/hr)	0.46	0.479	0.54	0.49	
8760 hrs/year NO <sub>x</sub> (tons/year)	0.46	0.54	0.63	0.54	1.9
8760 hrs/year CO (tons/year)	2.00	2.10	2.37	2.16	3.7
Engine Load (HP)**	68	68	68	68	
NO <sub>x</sub> (g/BHP-hr)	0.7	0.8	1.0	0.8	2.8
CO (g/BHP-hr)	3.1	3.2	3.6	3.3	4.8

\*Rated Maximum Fuel Consumption (provided by manufacturer)

\*\*Rated Maximum Engine Load

GA13-45  
Marathon Oil Company  
Tsubaki Hills 08-62-34-4H  
6/10/2013  
Test Run #1

Start Time 10:10  
Run Length 60  
Stop Time 11:10

Uncorrected Analyzer Data

Minute	Time	O <sub>2</sub> %vd	CO <sub>2</sub> %vd	NO <sub>x</sub> ppmvd	CO ppmvd
1	10:10	4.7	9.7	117.9	810.3
2	10:11	4.7	9.7	115.4	807.6
3	10:12	4.7	9.7	115.4	807.6
4	10:13	4.8	9.7	112.9	809.5
5	10:14	4.8	9.7	112.9	809.5
6	10:15	4.8	9.7	109.3	805.3
7	10:16	4.8	9.7	109.3	805.3
8	10:17	4.8	9.7	105.9	806.5
9	10:18	4.8	9.7	105.3	804.5
10	10:19	4.9	9.7	103.1	806.3
11	10:20	4.9	9.7	103.4	810.4
12	10:21	4.9	9.7	103.4	810.4
13	10:22	4.9	9.7	100.5	803.9
14	10:23	4.9	9.7	100.5	803.9
15	10:24	4.9	9.7	102.7	813.9
16	10:25	4.9	9.7	102.7	813.9
17	10:26	4.9	9.7	104.0	818.7
18	10:27	4.9	9.7	104.6	817.2
19	10:28	4.9	9.7	104.4	821.6
20	10:29	4.9	9.7	470.3	824.1
21	10:30	4.9	9.7	106.0	824.1
22	10:31	4.9	9.7	109.0	829.4
23	10:32	4.9	9.7	109.0	829.4
24	10:33	4.8	9.7	110.1	889.3
25	10:34	4.8	9.7	110.1	889.3
26	10:35	4.8	9.7	109.9	832.6
27	10:36	4.8	9.8	111.3	855.1
28	10:37	4.8	9.7	112.5	853.3
29	10:38	4.8	9.8	112.6	853.2
30	10:39	4.8	9.8	112.6	853.2
31	10:40	4.8	9.8	112.8	856.1
32	10:41	4.8	9.8	112.8	856.1
33	10:42	4.8	9.8	116.5	859.7
34	10:43	4.8	9.8	116.5	859.7
35	10:44	4.7	9.8	116.9	867.0
36	10:45	4.7	9.8	116.6	865.8
37	10:46	4.7	9.8	118.7	869.7
38	10:47	4.7	9.8	117.9	866.0
39	10:48	4.7	9.8	117.9	866.0
40	10:49	4.7	9.9	117.5	874.2
41	10:50	4.7	9.9	117.5	874.2
42	10:51	4.7	9.9	119.5	883.2
43	10:52	4.7	9.9	119.5	883.2
44	10:53	4.7	9.8	122.3	889.4
45	10:54	4.7	9.8	121.3	882.5
46	10:55	4.7	9.9	122.5	882.8
47	10:56	4.7	9.9	124.2	889.5
48	10:57	4.7	9.9	124.2	889.5
48	10:58	4.7	9.9	127.1	886.2
50	10:59	4.7	9.9	127.1	886.2
51	11:00	4.7	9.9	129.2	882.4
52	11:01	4.7	9.9	129.2	882.4
53	11:02	4.7	9.8	131.4	882.3
54	11:03	4.7	9.8	130.4	883.3
55	11:04	4.7	9.8	129.6	891.1
56	11:05	4.7	9.8	130.8	893.1
57	11:06	4.7	9.8	130.8	893.1
58	11:07	4.7	9.8	131.7	897.3
59	11:08	4.7	9.8	131.7	897.3
60	11:09	4.7	9.8	135.2	905.4
<b>Average</b>		<b>4.8</b>	<b>9.8</b>	<b>121.8</b>	<b>851.9</b>
C <sub>o</sub>		0.1	0.1	0.0	-0.5
C <sub>m</sub>		10.7	7.9	147.5	779.0
C <sub>ma</sub>		10.5	8.0	145.0	776.0
<b>Corrected Average:</b>		<b>4.7</b>	<b>10.0</b>	<b>119.7</b>	<b>848.6</b>

GA13-45  
Marathon Oil Company  
Tsubaki Hills 08-62-34-4H  
6/10/2013  
Test Run #2

Start Time 11:20  
Run Length 60  
Stop Time 12:20

Uncorrected Analyzer Data

Minute	Time	O <sub>2</sub> %vd	CO <sub>2</sub> %vd	NO <sub>x</sub> ppmvd	CO ppmvd
1	11:20	4.7	9.9	137.6	863.5
2	11:21	4.6	9.9	140.0	872.4
3	11:22	4.6	9.9	140.0	872.4
4	11:23	4.6	9.9	140.9	882.5
5	11:24	4.6	9.9	140.9	882.5
6	11:25	4.6	9.9	134.5	882.7
7	11:26	4.6	9.9	134.5	882.7
8	11:27	4.6	9.9	133.8	882.9
9	11:28	4.6	9.9	133.8	882.9
10	11:29	4.6	9.9	134.0	890.3
11	11:30	4.6	10.0	134.0	885.4
12	11:31	4.6	10.0	134.0	885.4
13	11:32	4.6	10.0	140.1	891.6
14	11:33	4.6	10.0	140.1	891.6
15	11:34	4.5	10.0	141.5	889.8
16	11:35	4.5	10.0	141.5	889.8
17	11:36	4.5	10.0	141.7	894.0
18	11:37	4.5	10.0	141.7	894.0
19	11:38	4.5	10.0	141.5	889.8
20	11:39	4.5	10.0	143.3	897.1
21	11:40	4.5	10.0	143.3	897.1
22	11:41	4.6	10.0	140.1	891.6
23	11:42	4.6	10.0	140.1	891.6
24	11:43	4.5	10.0	141.3	891.4
25	11:44	4.5	10.0	141.3	891.4
26	11:45	4.6	10.0	144.6	889.2
27	11:46	4.6	10.0	144.6	889.2
28	11:47	4.6	10.0	144.4	893.8
29	11:48	4.5	10.0	146.9	900.1
30	11:49	4.5	10.0	146.9	900.1
31	11:50	4.5	10.0	149.8	902.8
32	11:51	4.5	10.0	149.8	902.8
33	11:52	4.5	10.0	151.7	910.4
34	11:53	4.5	10.0	151.7	910.4
35	11:54	4.5	10.0	150.3	913.0
36	11:55	4.5	10.0	150.3	913.0
37	11:56	4.5	10.0	149.3	914.4
38	11:57	4.5	10.1	149.5	912.2
39	11:58	4.5	10.1	149.5	912.2
40	11:59	4.5	10.0	147.0	911.6
41	12:00	4.5	10.0	147.0	911.6
42	12:01	4.5	10.1	145.8	909.6
43	12:02	4.5	10.1	145.8	909.6
44	12:03	4.5	10.1	145.8	910.0
45	12:04	4.5	10.1	145.8	910.0
46	12:05	4.5	10.1	149.9	921.8
47	12:06	4.5	10.1	150.8	918.7
48	12:07	4.5	10.1	150.8	918.7
48	12:08	4.5	10.1	149.4	920.0
50	12:09	4.5	10.1	149.4	920.0
51	12:10	4.5	10.1	153.2	928.1
52	12:11	4.5	10.1	153.2	928.1
53	12:12	4.4	10.1	157.9	931.9
54	12:13	4.4	10.1	157.9	931.9
55	12:14	4.4	10.1	157.3	934.1
56	12:15	4.4	10.1	157.4	937.0
57	12:16	4.4	10.1	157.4	937.0
58	12:17	4.4	10.1	156.3	930.4
59	12:18	4.4	10.1	156.3	930.4
60	12:19	4.4	10.2	163.6	939.6
<b>Average</b>		<b>4.5</b>	<b>10.0</b>	<b>145.9</b>	<b>903.7</b>
C <sub>o</sub>		0.0	0.2	1.3	2.0
C <sub>m</sub>		10.6	8.0	150.0	780.5
C <sub>ma</sub>		10.5	8.0	145.0	776.0
<b>Corrected Average:</b>		<b>4.5</b>	<b>10.2</b>	<b>141.0</b>	<b>898.8</b>

GA13-45  
Marathon Oil Company  
Tsubaki Hills 08-62-34-4H  
6/10/2013  
Test Run #3

Start Time 12:30  
Run Length 60  
Stop Time 13:30

Uncorrected Analyzer Data

Minute	Time	O <sub>2</sub> %vd	CO <sub>2</sub> %vd	NO <sub>x</sub> ppmvd	CO ppmvd
1	12:30	4.3	10.0	161.1	979.8
2	12:31	4.3	10.0	161.1	979.8
3	12:32	4.3	10.0	162.3	977.6
4	12:33	4.3	10.1	166.1	980.4
5	12:34	4.3	10.1	166.1	980.4
6	12:35	4.3	10.1	163.1	936.5
7	12:36	4.3	10.1	163.1	936.5
8	12:37	4.3	10.1	159.4	933.9
9	12:38	4.3	10.1	159.4	933.9
10	12:39	4.3	10.1	152.7	933.7
11	12:40	4.3	10.1	152.7	933.7
12	12:41	4.3	10.1	151.8	932.0
13	12:42	4.3	10.1	158.7	940.6
14	12:43	4.3	10.1	158.7	940.6
15	12:44	4.3	10.1	155.8	930.9
16	12:45	4.3	10.1	155.8	930.9
17	12:46	4.3	10.1	161.1	939.4
18	12:47	4.3	10.1	161.1	939.4
19	12:48	4.3	10.1	157.8	941.4
20	12:49	4.3	10.1	157.8	941.4
21	12:50	4.3	10.1	157.9	953.5
22	12:51	4.3	10.1	155.8	955.9
23	12:52	4.3	10.1	155.8	955.9
24	12:53	4.3	10.1	157.8	958.5
25	12:54	4.3	10.1	157.8	958.5
26	12:55	4.3	10.1	157.2	957.9
27	12:56	4.3	10.1	157.2	957.9
28	12:57	4.3	10.2	159.4	964.4
29	12:58	4.3	10.2	159.4	964.4
30	12:59	4.2	10.2	162.4	1107.8
31	13:00	4.3	10.1	158.5	1102.5
32	13:01	4.3	10.1	158.5	1102.5
33	13:02	4.3	10.1	158.7	1106.4
34	13:03	4.3	10.1	158.7	1106.4
35	13:04	4.3	10.1	157.5	1100.5
36	13:05	4.3	10.1	157.5	1100.5
37	13:06	4.3	10.2	159.2	1109.4
38	13:07	4.3	10.2	159.2	1109.4
39	13:08	4.3	10.2	176.1	1110.0
40	13:09	4.3	10.2	176.6	1112.6
41	13:10	4.3	10.2	176.6	1112.6
42	13:11	4.3	10.1	174.7	1105.1
43	13:12	4.3	10.1	174.7	1105.1
44	13:13	4.3	10.1	174.2	1107.3
45	13:14	4.3	10.1	174.2	1107.3
46	13:15	4.3	10.1	174.1	1107.1
47	13:16	4.3	10.1	174.1	1107.1
48	13:17	4.3	10.1	176.7	1117.8
48	13:18	4.2	10.2	179.5	1119.4
50	13:19	4.2	10.2	179.5	1119.4
51	13:20	4.2	10.2	179.1	1120.7
52	13:21	4.2	10.2	179.1	1120.7
53	13:22	4.2	10.2	187.3	1126.8
54	13:23	4.2	10.2	187.3	1126.8
55	13:24	4.2	10.2	192.1	1130.8
56	13:25	4.2	10.2	192.1	1130.8
57	13:26	4.2	10.2	189.8	1122.8
58	13:27	4.2	10.2	191.0	1127.5
59	13:28	4.2	10.2	191.0	1127.5
60	13:29	4.2	10.2	190.1	1132.3
<b>Average</b>		<b>4.3</b>	<b>10.1</b>	<b>167.1</b>	<b>1035.2</b>
C <sub>o</sub>		0.0	0.2	1.3	3.0
C <sub>m</sub>		10.6	8.0	146.5	779.5
C <sub>ma</sub>		10.5	8.0	145.0	776.0
Corrected Average:		<b>4.2</b>	<b>10.3</b>	<b>165.5</b>	<b>1031.5</b>

Pawnee Creek  
9-57-18-1H

GA13-0045  
 Marathon Oil Company  
 Pawnee Creek 9-57-18-1H  
 6/11/2013

		Run #	1	2	3		
		Start Time	10:15	11:25	12:33		
		Stop Time	11:15	12:25	13:33		
<b>EPA Method 3A, 7E &amp; 10 Data</b>			<b>1</b>	<b>2</b>	<b>3</b>	<b>Average</b>	<b>Limit</b>
	O <sub>2</sub> (%vd)		2.9	2.6	2.6	2.7	
	CO <sub>2</sub> (%vd)		12.1	12.2	12.2	12.2	
	NO <sub>x</sub> (ppmvd)		352.5	436.5	478.0	422.3	
	CO (ppmvd)		208.0	307.9	359.0	291.6	
<b>Mass Emission Calculations (Using EPA Method 19)</b>			<b>1</b>	<b>2</b>	<b>3</b>	<b>Average</b>	<b>Limit</b>
F <sub>d</sub>	Method 19 F-Factor (dscf/mmBtu)		8,710	8,710	8,710	8,710	
	NO <sub>x</sub> (lb/mmBtu)		0.425	0.520	0.567	0.504	
	CO (lb/mmBtu)		0.153	0.223	0.259	0.212	
	Fuel Consumption (mmBtu/hr)*		0.66	0.66	0.66	0.66	
	NO <sub>x</sub> (lb/hr)		0.3	0.3	0.4	0.3	
	CO (lb/hr)		0.1	0.1	0.2	0.1	
8760 hrs/year	NO <sub>x</sub> (tons/year)		1.2	1.5	1.6	1.5	1.85
8760 hrs/year	CO (tons/year)		0.4	0.6	0.8	0.6	3.71
	Engine Load (HP)**		68	68	68	68	
	NO <sub>x</sub> (g/HP-hr)		1.9	2.3	2.5	2.2	2.8
	CO (g/HP-hr)		0.7	1.0	1.1	0.9	4.8

\*Rated Maximum Fuel Consumption (provided by manufacturer)

\*\*Rated Maximum Engine Load

GA13-0045  
Marathon Oil Company  
Pawnee Creek 9-57-18-1H  
6/11/2013  
Test Run #1

Start Time 10:15  
Run Length 60  
Stop Time 11:15

Uncorrected Analyzer Data

Minute	Time	O <sub>2</sub> %vd	CO <sub>2</sub> %vd	NO <sub>x</sub> ppmvd	CO ppmvd
1	10:15	3.0	11.7	319.4	282.4
2	10:16	3.0	11.7	319.4	282.4
3	10:17	2.9	11.7	333.1	250.3
4	10:18	2.9	11.8	352.9	233.4
5	10:19	2.9	11.8	352.3	218.7
6	10:20	2.9	11.8	349.3	209.9
7	10:21	2.9	11.8	349.9	202.7
8	10:22	2.9	11.8	360.8	198.7
9	10:23	2.9	11.8	356.8	199.7
10	10:24	2.8	11.8	364.2	200.6
11	10:25	2.8	11.8	364.2	200.6
12	10:26	2.9	11.8	357.2	203.9
13	10:27	2.9	11.8	359.8	205.9
14	10:28	2.9	11.8	349.7	205.2
15	10:29	2.9	11.8	341.2	205.6
16	10:30	2.9	11.8	350.8	207.7
17	10:31	2.9	11.8	345.0	207.9
18	10:32	3.0	11.8	343.5	209.9
19	10:33	2.9	11.8	336.7	210.0
20	10:34	2.9	11.8	336.7	210.0
21	10:35	3.0	11.8	336.5	213.1
22	10:36	3.0	11.8	338.3	215.6
23	10:37	3.0	11.8	338.2	216.9
24	10:38	3.0	11.8	339.1	216.3
25	10:39	3.0	11.8	343.8	213.2
26	10:40	3.0	11.8	339.7	205.5
27	10:41	3.0	11.8	341.8	197.9
28	10:42	3.0	11.8	358.7	209.6
29	10:43	3.0	11.8	358.7	209.6
30	10:44	3.0	11.8	361.5	211.8
31	10:45	3.0	11.8	348.0	212.5
32	10:46	3.0	11.8	342.8	210.1
33	10:47	3.0	11.8	345.4	206.7
34	10:48	3.0	11.8	344.5	199.9
35	10:49	3.0	11.8	343.6	194.1
36	10:50	3.0	11.8	345.2	190.6
37	10:51	3.0	11.8	346.9	189.0
38	10:52	3.0	11.8	346.9	189.0
39	10:53	3.0	11.8	352.9	187.4
40	10:54	2.9	11.8	364.5	188.4
41	10:55	3.0	11.8	358.4	185.3
42	10:56	3.0	11.8	360.5	184.9
43	10:57	3.0	11.8	358.3	188.8
44	10:58	3.0	11.8	358.5	188.4
45	10:59	3.0	11.8	360.0	186.8
46	11:00	3.0	11.8	351.3	184.5
47	11:01	3.0	11.8	351.3	184.5
48	11:02	3.0	11.8	352.6	184.2
49	11:03	2.9	11.8	362.3	188.3
50	11:04	3.0	11.8	358.1	185.6
51	11:05	2.9	11.8	360.3	188.0
52	11:06	2.9	11.8	364.1	194.5
53	11:07	2.9	11.8	369.9	199.2
54	11:08	2.9	11.9	372.5	202.8
55	11:09	2.8	11.9	374.8	216.4
56	11:10	2.8	11.9	374.8	216.4
57	11:11	2.9	11.9	371.7	223.9
58	11:12	2.8	11.9	379.2	233.6
59	11:13	2.8	11.9	375.8	235.8
60	11:14	2.9	11.9	375.9	235.7
<b>Average</b>		<b>2.9</b>	<b>11.8</b>	<b>352.8</b>	<b>207.2</b>
C <sub>o</sub>		0.1	0.3	3.5	0.0
C <sub>m</sub>		10.5	8.0	332.5	773.0
C <sub>ma</sub>		10.5	8.0	332.0	776.0
<b>Corrected Average:</b>		<b>2.9</b>	<b>12.1</b>	<b>352.5</b>	<b>208.0</b>

GA13-0045  
Marathon Oil Company  
Pawnee Creek 9-57-18-1H  
6/11/2013  
Test Run #2

Start Time 11:25  
Run Length 60  
Stop Time 12:25

Uncorrected Analyzer Data

Minute	Time	O <sub>2</sub> %vd	CO <sub>2</sub> %vd	NO <sub>x</sub> ppmvd	CO ppmvd
1	11:25	2.8	11.8	385.1	282.8
2	11:26	2.8	11.9	384.6	292.7
3	11:27	2.8	11.9	393.4	306.8
4	11:28	2.8	11.9	389.1	315.4
5	11:29	2.8	11.9	388.0	323.1
6	11:30	2.8	11.9	393.7	334.5
7	11:31	2.7	12.0	402.4	333.9
8	11:32	2.7	12.0	406.5	333.9
9	11:33	2.7	12.0	419.3	337.2
10	11:34	2.7	12.1	416.3	340.4
11	11:35	2.7	12.0	410.3	335.0
12	11:36	2.7	12.1	420.4	345.7
13	11:37	2.7	12.0	414.4	347.4
14	11:38	2.8	12.0	411.0	338.1
15	11:39	2.8	12.0	417.0	334.5
16	11:40	2.8	12.0	415.3	321.7
17	11:41	2.7	12.0	426.4	316.4
18	11:42	2.8	12.0	423.3	303.2
19	11:43	2.8	12.0	423.8	300.2
20	11:44	2.8	12.0	422.9	293.1
21	11:45	2.7	12.0	432.1	291.4
22	11:46	2.7	12.1	441.0	292.3
23	11:47	2.7	12.1	445.9	292.3
24	11:48	2.7	12.1	444.2	291.2
25	11:49	2.7	12.1	453.6	289.7
26	11:50	2.6	12.1	467.6	291.9
27	11:51	2.5	12.2	484.0	296.8
28	11:52	2.5	12.2	485.5	292.6
29	11:53	2.5	12.2	490.0	306.6
30	11:54	2.5	12.2	486.1	308.5
31	11:55	2.5	12.2	485.4	310.7
32	11:56	2.6	12.2	478.9	304.7
33	11:57	2.5	12.2	483.7	302.6
34	11:58	2.5	12.2	483.7	301.4
35	11:59	2.5	12.2	491.1	297.1
36	12:00	2.5	12.2	501.3	301.4
37	12:01	2.5	12.2	502.2	303.4
38	12:02	2.4	12.3	510.8	302.8
39	12:03	2.4	12.3	510.2	298.6
40	12:04	2.5	12.2	495.5	290.6
41	12:05	2.5	12.2	499.0	290.2
42	12:06	2.6	12.2	489.7	285.7
43	12:07	2.6	12.2	489.2	287.2
44	12:08	2.6	12.1	478.4	285.9
45	12:09	2.7	12.1	471.8	280.8
46	12:10	2.7	12.1	454.4	283.4
47	12:11	2.8	12.0	444.6	282.2
48	12:12	2.8	12.0	440.7	281.1
49	12:13	2.8	12.0	436.6	278.9
50	12:14	2.8	12.0	437.4	279.1
51	12:15	2.8	12.0	440.5	276.4
52	12:16	2.8	12.0	436.5	276.2
53	12:17	2.8	12.0	438.2	276.0
54	12:18	2.9	12.0	435.2	276.3
55	12:19	2.8	12.0	426.0	277.9
56	12:20	2.8	12.0	442.9	282.8
57	12:21	2.7	12.1	450.7	292.4
58	12:22	2.8	12.0	450.7	299.8
59	12:23	2.7	12.0	453.0	303.2
60	12:24	2.8	12.0	450.6	305.1
<b>Average</b>		<b>2.7</b>	<b>12.1</b>	<b>446.7</b>	<b>301.7</b>
C <sub>o</sub>		0.1	0.3	3.0	-1.0
C <sub>m</sub>		10.5	8.1	340.5	762.0
C <sub>ma</sub>		10.5	8.0	332.0	776.0
<b>Corrected Average:</b>		<b>2.6</b>	<b>12.2</b>	<b>436.5</b>	<b>307.9</b>

GA13-0045  
Marathon Oil Company  
Pawnee Creek 9-57-18-1H  
6/11/2013  
Test Run #3

Start Time 12:33  
Run Length 60  
Stop Time 13:33

Uncorrected Analyzer Data

Minute	Time	O <sub>2</sub> %vd	CO <sub>2</sub> %vd	NO <sub>x</sub> ppmvd	CO ppmvd
1	12:33	2.7	12.0	474.1	341.4
2	12:34	2.6	12.1	479.0	341.3
3	12:35	2.6	12.1	479.0	341.3
4	12:36	2.6	12.1	483.2	350.1
5	12:37	2.6	12.1	483.2	350.1
6	12:38	2.6	12.1	481.5	357.6
7	12:39	2.6	12.1	480.1	353.0
8	12:40	2.6	12.1	482.4	342.2
9	12:41	2.5	12.2	497.3	338.0
10	12:42	2.5	12.2	509.1	333.7
11	12:43	2.5	12.2	510.5	329.8
12	12:44	2.5	12.2	510.5	329.8
13	12:45	2.5	12.2	516.9	320.7
14	12:46	2.5	12.2	516.9	320.7
15	12:47	2.5	12.1	506.1	311.7
16	12:48	2.5	12.2	503.2	310.7
17	12:49	2.6	12.1	496.2	308.8
18	12:50	2.6	12.1	487.6	306.7
19	12:51	2.6	12.1	483.9	309.0
20	12:52	2.6	12.1	487.7	311.6
21	12:53	2.6	12.1	487.7	311.6
22	12:54	2.6	12.1	488.2	304.9
23	12:55	2.6	12.1	488.2	304.9
24	12:56	2.6	12.1	506.3	309.0
25	12:57	2.6	12.1	511.0	311.5
26	12:58	2.5	12.1	522.7	316.0
27	12:59	2.5	12.1	530.4	320.0
28	13:00	2.6	12.1	518.1	318.8
29	13:01	2.6	12.1	514.2	320.4
30	13:02	2.6	12.1	514.2	320.4
31	13:03	2.6	12.1	506.6	323.3
32	13:04	2.6	12.1	506.6	323.3
33	13:05	2.6	12.1	491.8	333.6
34	13:06	2.7	12.0	480.6	331.2
35	13:07	2.7	12.1	483.5	329.3
36	13:08	2.7	12.1	494.3	328.3
37	13:09	2.7	12.0	487.9	320.3
38	13:10	2.6	12.1	489.1	321.3
39	13:11	2.6	12.1	489.1	321.3
40	13:12	2.6	12.1	514.9	335.4
41	13:13	2.6	12.1	514.9	335.4
42	13:14	2.5	12.2	520.0	370.4
43	13:15	2.4	12.2	529.9	394.9
44	13:16	2.5	12.2	524.9	413.5
45	13:17	2.5	12.1	522.4	426.3
46	13:18	2.6	12.1	510.2	423.9
47	13:19	2.5	12.1	514.0	435.3
48	13:20	2.5	12.1	514.0	435.3
49	13:21	2.6	12.1	496.8	431.4
50	13:22	2.6	12.1	496.8	431.4
51	13:23	2.6	12.1	505.5	443.6
52	13:24	2.6	12.1	507.4	447.1
53	13:25	2.6	12.1	501.7	433.6
54	13:26	2.6	12.0	500.2	426.6
55	13:27	2.7	12.0	499.1	418.6
56	13:28	2.7	12.0	488.0	396.9
57	13:29	2.7	12.0	488.0	396.9
58	13:30	2.7	12.0	493.7	378.8
59	13:31	2.7	12.0	493.7	378.8
60	13:32	2.7	12.0	490.0	373.1
<b>Average</b>		<b>2.6</b>	<b>12.1</b>	<b>500.1</b>	<b>353.4</b>
C <sub>v</sub>		0.0	0.3	5.5	-1.0
C <sub>m</sub>		10.5	8.1	349.0	765.0
C <sub>ma</sub>		10.5	8.0	332.0	776.0
<b>Corrected Average:</b>		<b>2.6</b>	<b>12.2</b>	<b>478.0</b>	<b>359.0</b>

Crow Valley  
7-62-32-1H

GA13-0045  
 Marathon Oil Company  
 Crow Valley 7-62-32-1H  
 6/14/2013

Run #	1	2	3
Start Time	8:27	9:38	10:49
Stop Time	9:27	10:38	11:49

EPA Method 3A, 7E & 10 Data	1	2	3	Average	Limit
O <sub>2</sub> (%vd)	1.4	1.4	1.5	1.4	
CO <sub>2</sub> (%vd)	11.5	11.5	11.5	11.5	
NO <sub>x</sub> (ppmvd)	447.4	452.2	510.9	470.2	
CO (ppmvd)	1456.5	1409.9	1410.2	1425.5	

Mass Emission Calculations (Using EPA Method 19)	1	2	3	Average	Limit
F <sub>d</sub> Method 19 F-Factor (dscf/mmBtu)	8,710	8,710	8,710	8,710	
NO <sub>x</sub> (lb/mmBtu)	0.499	0.504	0.571	0.525	
CO (lb/mmBtu)	0.989	0.957	0.960	0.969	
Fuel Consumption (mmBtu/hr)*	0.66	0.66	0.66	0.66	
NO <sub>x</sub> (lb/hr)	0.3	0.3	0.4	0.3	
CO (lb/hr)	0.7	0.6	0.6	0.6	
8760 hrs/year NO <sub>x</sub> (tons/year)	1.4	1.5	1.7	1.5	1.9
8760 hrs/year CO (tons/year)	2.9	2.8	2.8	2.8	3.7
Engine Load (HP)**	68	68	68	68	
NO <sub>x</sub> (g/HP-hr)	2.2	2.2	2.5	2.3	2.8
CO (g/HP-hr)	4.4	4.2	4.2	4.3	4.8

\*Rated Maximum Fuel Consumption (provided by manufacturer)

\*\*Rated Maximum Engine Load

GA13-0045  
Marathon Oil Company  
Crow Valley 7-62-32-1H  
6/14/2013  
Test Run #1

Start Time 8:27  
Run Length 60  
Stop Time 9:27

Uncorrected Analyzer Data

Minute	Time	O <sub>2</sub> %vd	CO <sub>2</sub> %vd	NO <sub>x</sub> ppmvd	CO ppmvd
1	8:27	1.5	11.0	419.7	1320.4
2	8:28	1.5	11.0	419.7	1320.4
3	8:29	1.5	10.9	413.2	1398.6
4	8:30	1.3	11.1	420.0	1373.6
5	8:31	1.5	11.0	425.9	1328.7
6	8:32	1.4	11.1	429.8	1346.7
7	8:33	1.4	11.1	429.8	1346.7
8	8:34	1.5	11.0	439.5	1344.2
9	8:35	1.5	11.0	439.5	1344.2
10	8:36	1.2	11.3	434.7	1408.5
11	8:37	1.2	11.3	434.7	1408.5
12	8:38	1.5	11.0	421.7	1547.6
13	8:39	1.5	11.0	431.7	1559.2
14	8:40	1.5	11.1	448.0	1417.8
15	8:41	1.4	11.1	450.0	1404.6
16	8:42	1.4	11.1	450.0	1404.6
17	8:43	1.4	11.2	451.7	1282.5
18	8:44	1.4	11.2	451.7	1282.5
19	8:45	1.5	11.0	442.3	1416.1
20	8:46	1.5	11.0	442.3	1416.1
21	8:47	1.4	11.1	443.6	1437.3
22	8:48	1.5	11.1	490.8	1102.9
23	8:49	1.5	11.1	466.1	1400.8
24	8:50	1.4	11.1	455.5	1491.7
25	8:51	1.4	11.1	455.5	1491.7
26	8:52	1.5	11.1	457.5	1392.9
27	8:53	1.5	11.1	457.5	1392.9
28	8:54	1.1	11.4	430.0	1647.9
29	8:55	1.1	11.4	430.0	1647.9
30	8:56	1.4	11.1	454.5	1517.2
31	8:57	1.1	11.4	436.8	1585.4
32	8:58	1.2	11.4	457.9	1407.8
33	8:59	1.3	11.3	451.5	1475.4
34	9:00	1.3	11.3	451.5	1475.4
35	9:01	1.4	11.1	418.4	1699.4
36	9:02	1.4	11.1	418.4	1699.4
37	9:03	1.3	11.3	482.6	1337.2
38	9:04	1.3	11.3	482.6	1337.2
39	9:05	1.5	11.1	472.7	1490.5
40	9:06	1.2	11.4	459.3	1581.9
41	9:07	1.3	11.2	440.2	1708.0
42	9:08	1.1	11.4	425.2	1748.2
43	9:09	1.1	11.4	425.2	1748.2
44	9:10	1.3	11.2	473.2	1575.9
45	9:11	1.3	11.2	473.2	1575.9
46	9:12	1.2	11.4	445.2	1657.8
47	9:13	1.2	11.4	445.2	1657.8
48	9:14	1.2	11.4	499.1	1049.7
49	9:15	1.2	11.4	476.9	1528.6
50	9:16	1.0	11.5	465.1	1652.1
51	9:17	1.1	11.4	457.2	1760.0
52	9:18	1.1	11.4	457.2	1760.0
53	9:19	1.3	11.3	473.8	1379.0
54	9:20	1.3	11.3	473.8	1379.0
55	9:21	1.3	11.3	456.6	1528.9
56	9:22	1.3	11.3	456.6	1528.9
57	9:23	1.3	11.2	477.6	1517.9
58	9:24	1.4	11.1	475.1	1419.1
59	9:25	1.3	11.2	463.9	1519.7
60	9:26	1.4	11.1	473.0	1521.1
<b>Average</b>		<b>1.3</b>	<b>11.2</b>	<b>450.0</b>	<b>1475.0</b>
C <sub>o</sub>		-0.1	-0.1	2.1	-0.8
C <sub>m</sub>		10.3	7.8	334.5	785.5
C <sub>ma</sub>		10.5	8.0	332.0	776.0
<b>Corrected Average:</b>		<b>1.4</b>	<b>11.5</b>	<b>447.4</b>	<b>1456.5</b>

GA13-0045  
Marathon Oil Company  
Crow Valley 7-62-32-1H  
6/14/2013  
Test Run #2

Start Time 9:38  
Run Length 60  
Stop Time 10:38

Uncorrected Analyzer Data

Minute	Time	O <sub>2</sub> %vd	CO <sub>2</sub> %vd	NO <sub>x</sub> ppmvd	CO ppmvd
1	9:38	1.5	11.1	411.9	1612.9
2	9:39	1.4	11.1	414.6	1660.8
3	9:40	1.4	11.1	414.6	1660.8
4	9:41	1.3	11.2	395.4	1536.2
5	9:42	1.3	11.2	395.4	1536.2
6	9:43	1.2	11.3	390.7	1342.9
7	9:44	0.9	11.5	355.6	1579.7
8	9:45	1.1	11.5	399.2	1340.8
9	9:46	1.2	11.3	386.7	1530.4
10	9:47	1.2	11.3	379.4	1560.1
11	9:48	1.3	11.4	423.2	1061.3
12	9:49	1.3	11.4	423.2	1061.3
13	9:50	1.4	11.3	438.2	965.4
14	9:51	1.4	11.3	438.2	965.4
15	9:52	1.4	11.4	494.3	786.5
16	9:53	1.3	11.5	445.5	1277.5
17	9:54	1.2	11.5	449.0	1445.9
18	9:55	1.1	11.7	451.5	1456.8
19	9:56	1.1	11.6	457.6	1523.1
20	9:57	1.1	11.6	455.8	1494.1
21	9:58	1.1	11.6	455.8	1494.1
22	9:59	1.3	11.5	465.5	1387.5
23	10:00	1.3	11.5	465.5	1387.5
24	10:01	1.2	11.5	447.3	1614.4
25	10:02	1.2	11.5	425.6	1748.7
26	10:03	1.4	11.4	449.2	1525.0
27	10:04	1.3	11.4	454.2	1585.4
28	10:05	1.3	11.4	462.7	1435.1
29	10:06	1.6	11.2	496.1	1321.5
30	10:07	1.6	11.2	496.1	1321.5
31	10:08	1.4	11.4	491.1	1318.2
32	10:09	1.4	11.4	491.1	1318.2
33	10:10	1.4	11.4	478.7	1415.7
34	10:11	1.1	11.6	442.2	1729.3
35	10:12	1.3	11.4	463.7	1514.5
36	10:13	1.5	11.3	466.1	1300.5
37	10:14	1.3	11.5	490.1	1286.5
38	10:15	1.2	11.5	455.3	1560.0
39	10:16	1.2	11.5	455.3	1560.0
40	10:17	1.3	11.5	479.3	1524.2
41	10:18	1.3	11.5	479.3	1524.2
42	10:19	1.5	11.3	498.5	1378.0
43	10:20	1.4	11.4	485.3	1418.6
44	10:21	1.1	11.6	446.5	1666.5
45	10:22	1.1	11.6	452.5	1647.9
46	10:23	1.1	11.6	453.6	1567.0
47	10:24	1.1	11.6	483.0	1386.1
48	10:25	1.1	11.6	483.0	1386.1
49	10:26	1.3	11.5	470.4	1514.0
50	10:27	1.3	11.5	470.4	1514.0
51	10:28	1.3	11.5	475.4	1455.7
52	10:29	1.3	11.5	474.9	1394.8
53	10:30	1.4	11.4	468.8	1427.1
54	10:31	1.5	11.3	480.2	1382.8
55	10:32	1.3	11.4	464.4	1518.4
56	10:33	1.3	11.5	453.8	1534.1
57	10:34	1.3	11.5	453.8	1534.1
58	10:35	1.3	11.6	474.0	1343.5
59	10:36	1.3	11.6	474.0	1343.5
60	10:37	1.2	11.6	475.9	1492.5
<b>Average</b>		<b>1.3</b>	<b>11.4</b>	<b>452.8</b>	<b>1436.2</b>
C <sub>o</sub>		-0.1	0.1	6.0	2.2
C <sub>m</sub>		10.2	8.0	334.0	791.5
C <sub>ma</sub>		10.5	8.0	332.0	776.0
<b>Corrected Average:</b>		<b>1.4</b>	<b>11.5</b>	<b>452.2</b>	<b>1409.9</b>

GA13-0045  
Marathon Oil Company  
Crow Valley 7-62-32-1H  
6/14/2013  
Test Run #3

Start Time 10:49  
Run Length 60  
Stop Time 11:49

Uncorrected Analyzer Data

Minute	Time	O <sub>2</sub> %vd	CO <sub>2</sub> %vd	NO <sub>x</sub> ppmvd	CO ppmvd
1	10:49	1.4	11.2	499.4	1442.6
2	10:50	1.4	11.2	499.4	1442.6
3	10:51	1.4	11.3	499.9	1423.9
4	10:52	1.4	11.4	508.8	1402.3
5	10:53	1.3	11.5	506.4	1444.7
6	10:54	1.4	11.4	515.6	1399.4
7	10:55	1.3	11.5	526.3	1288.7
8	10:56	1.2	11.5	488.3	1552.1
9	10:57	1.2	11.5	488.3	1552.1
10	10:58	1.5	11.3	517.0	1401.9
11	10:59	1.5	11.3	517.0	1401.9
12	11:00	1.3	11.5	521.6	1336.9
13	11:01	1.2	11.6	497.5	1555.1
14	11:02	1.2	11.6	505.4	1405.9
15	11:03	1.2	11.6	510.6	1402.0
16	11:04	1.1	11.7	520.4	1376.2
17	11:05	1.2	11.7	511.9	1374.5
18	11:06	1.2	11.7	511.9	1374.5
19	11:07	1.5	11.4	519.0	1344.4
20	11:08	1.5	11.4	519.0	1344.4
21	11:09	1.6	11.3	522.7	1407.9
22	11:10	1.3	11.5	479.4	1626.7
23	11:11	1.3	11.5	495.4	1551.9
24	11:12	1.3	11.5	495.0	1499.5
25	11:13	1.1	11.7	470.4	1715.4
26	11:14	1.1	11.7	483.9	1769.6
27	11:15	1.1	11.7	483.9	1769.6
28	11:16	1.1	11.6	506.4	1488.5
29	11:17	1.1	11.6	506.4	1488.5
30	11:18	1.2	11.6	531.4	1282.8
31	11:19	1.2	11.6	528.9	1351.3
32	11:20	1.3	11.5	518.1	1503.5
33	11:21	1.2	11.6	498.8	1578.7
34	11:22	1.4	11.4	509.3	1494.5
35	11:23	1.2	11.7	541.6	1252.0
36	11:24	1.2	11.7	541.6	1252.0
37	11:25	1.3	11.6	547.1	1298.8
38	11:26	1.3	11.6	547.1	1298.8
39	11:27	1.2	11.6	511.1	1481.1
40	11:28	1.3	11.6	528.1	1337.3
41	11:29	1.1	11.6	491.9	1695.5
42	11:30	1.5	11.3	510.8	1530.1
43	11:31	1.3	11.6	544.2	1242.2
44	11:32	1.6	11.3	521.3	1389.8
45	11:33	1.6	11.3	521.3	1389.8
46	11:34	1.3	11.5	503.7	1559.8
47	11:35	1.3	11.5	503.7	1559.8
48	11:36	1.3	11.4	514.0	1584.4
49	11:37	1.3	11.5	509.1	1530.7
50	11:38	1.1	11.7	493.0	1625.9
51	11:39	1.1	11.7	521.3	1417.7
52	11:40	1.3	11.5	520.9	1502.6
53	11:41	1.3	11.5	536.1	1407.9
54	11:42	1.3	11.5	536.1	1407.9
55	11:43	1.4	11.4	529.5	1460.7
56	11:44	1.4	11.4	529.5	1460.7
57	11:45	1.3	11.5	541.2	1306.2
58	11:46	1.3	11.4	529.9	1505.8
59	11:47	1.3	11.4	515.4	1654.3
60	11:48	1.3	11.5	504.6	1568.1
<b>Average</b>		<b>1.3</b>	<b>11.5</b>	<b>513.5</b>	<b>1458.6</b>
C <sub>o</sub>		-0.2	0.1	8.0	2.0
C <sub>m</sub>		10.2	8.1	336.5	803.5
C <sub>ma</sub>		10.5	8.0	332.0	776.0
<b>Corrected Average:</b>		<b>1.5</b>	<b>11.5</b>	<b>510.9</b>	<b>1410.2</b>